

WHAT IS CLAIMED IS:

1. An endovascular graft for supporting a preselected length of a patient's body lumen comprising a plurality of separate thin wall graft members configured to be layered in a deployed state with at least two of the thin wall graft members having a length greater than the preselected length of the patient's body lumen.

2. The endovascular graft of claim 1 wherein no single thin wall graft member has sufficient mechanical strength in a deployed state to provide a desired amount of support for the preselected length of a patient's body lumen.

3. The endovascular graft of claim 2 wherein the thin wall graft members are configured to provide sufficient mechanical strength to provide a desired amount of support for the preselected length of the patient's body lumen in portions of the graft where at least two of the thin wall graft members are overlapped.

4. The endovascular graft of claim 2 wherein the graft comprises at least 3 thin wall graft members and the thin wall graft members are configured to provide sufficient mechanical strength to provide a desired amount of support for the preselected portion of the patient's body lumen only in portions of the graft where all of the thin wall graft members are overlapped.

5. The graft of claim 1 wherein an inner most thin wall graft member has an axial length substantially greater than all other thin wall graft members such

that the inner-most thin wall graft member can extend longitudinally beyond a distal end and a proximal end of all other thin wall graft members when deployed.

6. The graft of claim 1 wherein the thin wall graft members are configured to be expanded to a transverse dimension of up to about 40 mm and constrained to a maximum outer transverse dimension of down to about 3 mm.

7. The graft of claim 1 wherein the separate thin wall graft members are individually deliverable.

8. The graft of claim 1 wherein each thin wall graft member further comprises an anchoring mechanism at both ends and at least two of the thin wall graft members have a longitudinal length sufficient to span the preselected length of the patient's body lumen and engage tissue of sufficient integrity to support the anchoring mechanisms at both ends of the at least two thin wall graft members.

9. A method of deploying an endovascular graft within a body passageway of a patient comprising:

a) providing an endovascular graft comprising at least two thin wall graft members configured to be layered in a deployed state;

b) percutaneously delivering a first thin wall graft member through a low profile delivery catheter system to a desired site within a passageway of a patient's body and deploying the first thin wall graft member at the desired site;

c) percutaneously delivering a second thin wall graft member through a low profile delivery catheter system and positioning the second thin wall graft member within a longitudinal lumen of the deployed first thin wall graft member; and

5 d) deploying the second thin wall graft member within the longitudinal lumen of the deployed first thin wall graft member.

10. The method of claim 9 wherein an inner most thin wall graft member extends longitudinally beyond the other thin wall graft members and engages the artery wall directly.

10 11. A method of deploying an endovascular graft within a body passageway of a patient comprising:

a) providing an endovascular graft comprising at least two thin wall graft members configured to be layered in a deployed state;

15 b) percutaneously delivering a first thin wall graft member through a low profile delivery catheter system to a preselected site within a passageway of a patient's body;

20 c) percutaneously delivering a second thin wall graft member through a low profile delivery catheter system and positioning the second thin wall graft member within a longitudinal lumen of the first thin wall graft member; and

d) deploying the second thin wall graft member within the longitudinal lumen of the deployed first thin wall graft member and simultaneously deploying the first thin wall graft member until the first and second thin wall graft members are in a desired configuration within the passageway of the patient.

12. The method of claim 11 wherein an inner most thin wall graft member extends longitudinally beyond the other thin wall graft members and engages the artery wall directly.

13. The method of claim 11 wherein the passageway of the patient has a curvature and the thin wall graft members are progressively deployed such that each added thin wall graft member is offset in the same longitudinal direction through the curvature of the patient's body passageway so that there are at least two layers of thin wall graft member over every portion of the preselected length of the patient's body passageway but each added thin wall graft member adds to the length of the graft in the amount of longitudinal offset and is sufficiently short in longitudinal length to absorb the curvature of the passageway without undue kinking or folding.

14. A kit comprising an endovascular graft having at least a first thin wall graft member and a second thin wall graft member with the second thin wall graft member configured to fit and be deployed within a longitudinal lumen of the first thin wall graft member.

15. The kit of claim 14 wherein the first and second thin wall graft members configured to be deployed within a low profile delivery catheter system.

16. The kit of claim 15 wherein the first and second thin wall graft members are configured to be delivered through a delivery catheter system with a maximum distal outer transverse dimension of up to about 4 mm.

17. An endovascular graft for supporting a preselected length of a patient's body lumen comprising a plurality of thin wall graft members that are linked so as to allow relative longitudinal movement and that are configured to be layered in a deployed state with at least two of the thin wall graft members having a length greater than the preselected length of the patient's body lumen.

18. The endovascular graft of claim 17 wherein the plurality of thin wall graft members are configured to be telescopically linked to allow for longitudinal extension during delivery and layering in a deployed state.

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